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Category: Rail

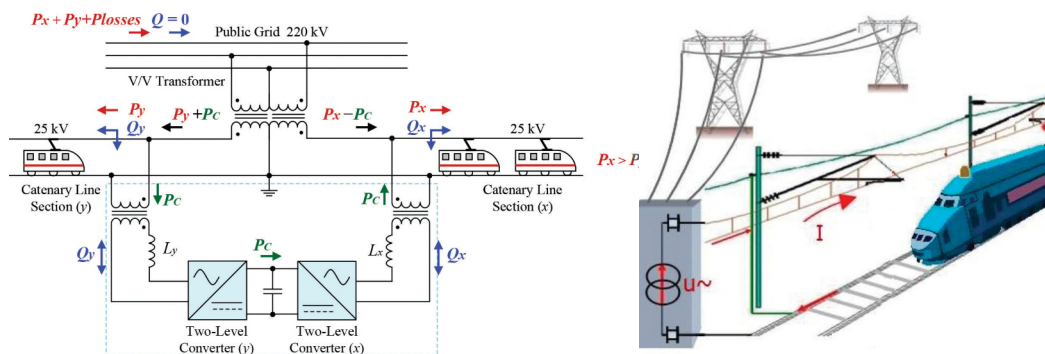
Country: Portugal

Research Area 4: Electrification, Energy and Power Alternatives

Idea Number: 11

Power quality improvement in electrified railway using a rail power conditioner based on modular multilevel converter

Nowadays, most of the high-speed electric locomotives use the AC power system for long-distance electrification. The AC traction power system is normally a single-phase system connected through power transformers to the three-phase public power system. These high-speed trains usually cause significant perturbations in the electrical system around or nearby, thus impacting the power quality of the system as a whole. Despite this problem, the improvement of power quality on the single-phase traction power system has not been historically investigated in detail because the electrical traction load has a poor power quality by nature. This is because of the single-phase non-linear load characteristics that causes three-phase voltages and currents imbalance. Consequently, most of the power quality improvement studies in railway electrification are focusing on the power quality improvement of the three-phase public power system. The typical power quality problems in high-speed electrified railway systems are: current imbalance, voltage and current harmonics, reactive power, and low-frequency voltage fluctuations. Furthermore, the non-linear and the dynamic nature of the high-speed electric locomotives make the improvement of such power quality problems a rather difficult work. In this context, the idea of this project is to use a power compensator-based power electronics technology known as "rail power conditioner" to balance active power and compensate reactive power.



Key Characteristics

AC traction power system • High-speed trains